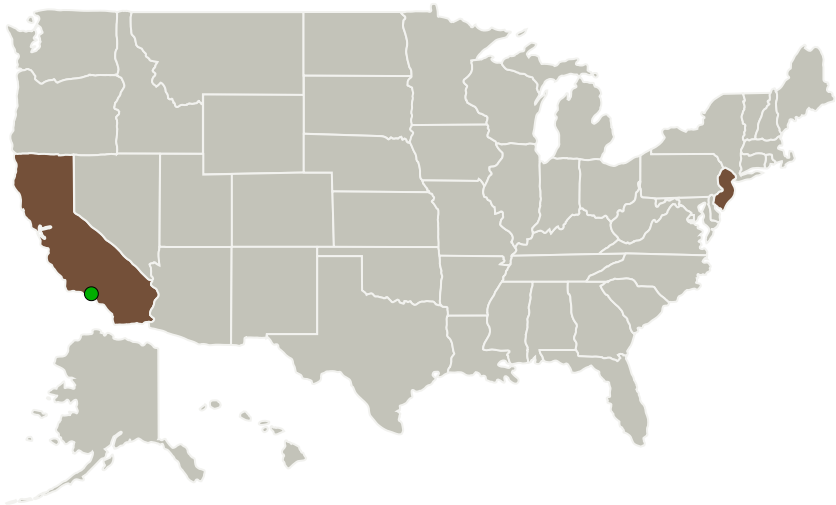
RUSH: A Rad-Hard Unified Scalable Heterogeneous Processing Architecture, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Space presents a challenging environment for computing. Extended development times and radiation tolerance requirements leave hardware performance a decade or more behind the terrestrial state-of-the-art at the time of deployment. Additionally, once deployed, hardware changes are impractical, encouraging a trend towards increased software programmability. However, topside pressure from application advancements are forcing space-based platforms to improve throughput and latency while reducing power consumption. A popular approach to addressing the tension between these requirements is the heterogeneous processing architecture. By providing multiple hardware tools that optimally support a subset of the anticipated workload, a heterogeneous architecture can offer a diverse processing toolset to the application developer. However, programming these systems is extremely challenging because of variations in toolsets and data sharing interfaces. As a result, data sharing and dynamic workload scheduling across heterogeneous architectures is often suboptimal and hindered by poor scalability. Maxentric proposes to solve this problem with RUSH, a heterogeneous processing architecture with a unified programming model for rapid development. RUSH employs a rad-hard multicore processor as a host and an FPGA as an accelerator chip. The RUSH software layer unifies these architectures through an innovative programming model described in the proposal.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
MaXentric Technologies, LLC	Lead Organization	Industry	Fort Lee, New Jersey
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New Jersey

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138477)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MaXentric Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

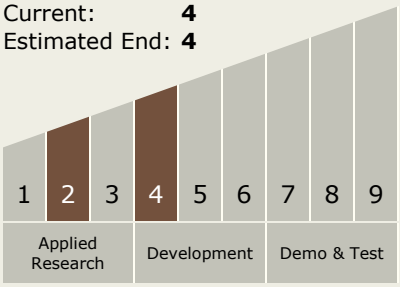
Carlos Torrez

Principal Investigator:

Brandon Beresini

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.8 Software Analysis and Design Tools

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System